connected to each other, whereby the resonator **1700** may have an electrically closed-loop structure. As illustrated in FIG. **17**, the capacitor **1720** may be inserted or otherwise positioned between the first signal conducting portion **1711** and the second signal conducting portion **1712**. For example, the capacitor **1720** may be inserted into a space between the first signal conducting portion **1711** and the second signal conducting portion **1712**. The capacitor **1720** may include, for example, a lumped element, a distributed element, and the like. In one implementation, a distributed capacitor having the shape of the distributed element may include zigzagged conductor lines and a dielectric material having a relatively high permittivity positioned between the zigzagged conductor lines.

[0141] When the capacitor **1720** is inserted into the transmission line, the resonator **1700** may have a property of a metamaterial, in some instances, as discussed above.

[0142] For example, when a capacitance of the capacitor is a lumped element, the resonator **1700** may have the characteristic of the metamaterial. When the resonator **1700** has a negative magnetic permeability by appropriately adjusting the capacitance of the capacitor **1720**, the resonator **1700** may also be referred to as an MNG resonator. Various criteria may be applied to determine the capacitance of the capacitor **1720**. For example, the various criteria may include one or more of the following: a criterion to enable the resonator **1700** to have the characteristic of the metamaterial, a criterion to enable the resonator **1700** to have a negative magnetic permeability in a target frequency, a criterion to enable the resonator **1700** to have a zeroth order resonance characteristic in the target frequency, or the like. Based on at least one criterion among the aforementioned criteria, the capacitance of the capacitor **1720** may be determined.

[0143] The resonator **1700**, also referred to as the MNG resonator **1700**, may have a zeroth order resonance characteristic (i.e., having, as a resonance frequency, a frequency when a propagation constant is "0"). If the resonator **1700** has a zeroth order resonance characteristic, the resonance frequency may be independent with respect to a physical size of the MNG resonator **1700**. Thus, by appropriately designing the capacitor **1720**, the MNG resonator **1700** may sufficiently change the resonance frequency without significantly changing the physical size of the MNG resonator **1700**.

[0144] Referring to the MNG resonator **1700** of FIG. **17**, in a near field, the electric field may be concentrated on the capacitor **1720** inserted into the transmission line. Accordingly, due to the capacitor **1720**, the magnetic field may become dominant in the near field. And, since the MNG resonator **1700** having the zeroth-order resonance characteristic may have characteristics similar to a magnetic dipole, the magnetic field may become dominant in the near field. A relatively small amount of the electric field formed due to the insertion of the capacitor **1720** may be concentrated on the capacitor **1720** and thus, the magnetic field may become further dominant.

[0145] Also, the MNG resonator **1700** may include the matcher **1730** to be used in impedance matching. The matcher **1730** may be configured to appropriately adjust the strength of magnetic field of the MNG resonator **1700**. The impedance of the MNG resonator **1700** may be determined by the matcher **1730**. In one or more embodiments, current may flow in the MNG resonator **1700** via a connector **1740**, or may flow out from the MNG resonator **1700** via the connector **1740**. And the connector **1740** may be connected to the ground conducting portion **1713** or the matcher **1730**.

[0146] As illustrated in FIG. **17**, the matcher **1730** may be positioned within the loop formed by the loop structure of the resonator **1700**. The matcher **1730** may be configured to adjust the impedance of the resonator **1700** by changing the physical shape of the matcher **1730**. For example, the matcher **1730** may include the conductor **1731** to be used in the impedance matching in a location separate from the ground conducting portion **1713** by a distance h. The impedance of the resonator **1700** may be changed by adjusting the distance h.

[0147] In some implementations, a controller may be provided to control the matcher **1730**. In this case, the matcher **1730** may change the physical shape of the matcher **1730** based on a control signal generated by the controller. For example, the distance h between the conductor **1731** of the matcher **1730** and the ground conducting portion **1713** may be increased or decreased based on the control signal. Accordingly, the physical shape of the matcher **1730** may be changed such that the impedance of the resonator **1700** may be adjusted. The distance h between the conductor **1731** of the matcher **1730** and the ground conducting portion **1713** may be adjusted using a variety of schemes. For example, one or more conductors may be included in the matcher **1730** and the distance h may be adjusted by adaptively activating one of the conductors. Alternatively or additionally, the distance h may be adjusted by adjusting the physical location of the conductor **1731** up and down. For instance, the distance h may be controlled based on the control signal of the controller. The controller may generate the control signal using various factors. As illustrated in FIG. **17**, the matcher **1730** may be configured as a passive element such as the conductor **1731**, for instance. Of course, in other embodiments, the matcher **1730** may be configured as an active element such as a diode, a transistor, or the like. If the active element is included in the matcher **1730**, the active element may be driven based on the control signal generated by the controller, and the impedance of the resonator **1700** may be adjusted based on the control signal. For example, if the active element is a diode included in the matcher **1730**, the impedance of the resonator **1700** may be adjusted depending on whether the diode is in an ON state or in an OFF state.

[0148] In some implementations, a magnetic core may be further provided to pass through the resonator **1700** configured as the MNG resonator. The magnetic core may increase the power transmission distance.

[0149] FIG. **18** illustrates a resonator **1800** for a wireless power transmission configured as a bulky type.

[0150] As used herein, the term "bulky type" may refer to a seamless connection connecting at least two parts in an integrated form.

[0151] Referring to FIG. **18**, a first signal conducting portion **1811** and a conductor **1842** may be integrally formed, rather than being separately manufactured and being connected to each other. Similarly, a second signal conducting portion **1812** and a conductor **1841** may also be integrally manufactured.

[0152] When the second signal conducting portion **1812** and the conductor **1841** are separately manufactured and then are connected to each other, a loss of conduction may occur due to a seam **1850**. Thus, in some implementations,